



Billing Code 4910-13

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA-2018-0193; Special Conditions No. 25-718-SC]

Special Conditions: Bombardier Inc. Model BD-700-2A12 and BD-700-2A13 Series

Airplanes; Synthetic Vision System on Head-Up Display

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions; request for comments.

SUMMARY: These special conditions are issued for the Bombardier Inc. (Bombardier) Model BD-700-2A12 and BD-700-2A13 series airplanes. These airplanes will have a novel or unusual design feature when compared to the state of technology envisioned in the applicable airworthiness standards for transport-category airplanes. These airplanes incorporate a novel or unusual design feature associated with a synthetic vision system (SVS) that displays video imagery on the head-up display (HUD). The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: This action is effective on Bombardier on **[INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER]**. Send your comments by **[INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

ADDRESSES: Send comments identified by docket number **FAA-2018-0193** using any of the following methods:

- *Federal eRegulations Portal:* Go to <http://www.regulations.gov/> and follow the online instructions for sending your comments electronically.
- *Mail:* Send comments to Docket Operations, M-30, U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE., Room W12-140, West Building Ground Floor, Washington, DC, 20590-0001.
- *Hand Delivery or Courier:* Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.
- *Fax:* Fax comments to Docket Operations at 202-493-2251.

Privacy: The FAA will post all comments it receives, without change, to <http://www.regulations.gov/>, including any personal information the commenter provides. Using the search function of the docket Web site, anyone can find and read the electronic form of all comments received into any FAA docket, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT's complete Privacy Act Statement can be found in the *Federal Register* published on April 11, 2000 (65 FR 19477-19478).

Docket: Background documents or comments received may be read at <http://www.regulations.gov/> at any time. Follow the online instructions for accessing the docket or go to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: John Stuber, FAA, Airplane and Flight Crew Interface Section, AIR-671, Transport Standards Branch, Policy and Innovation Division,

Aircraft Certification Service, 2200 South 216th Street, Des Moines, Washington; 98198; telephone 206-231-3164; facsimile 206-231-3398.

SUPPLEMENTARY INFORMATION: The substance of these special conditions has been subjected to the notice and comment period in several prior instances and has been derived without substantive change from the substance contained herein. Therefore, the FAA has determined that prior public notice and comment are unnecessary, and finds that, for the same reason, good cause exists for adopting these special conditions upon publication in the *Federal Register*.

Comments Invited

We invite interested people to take part in this rulemaking by sending written comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data.

We will consider all comments we receive by the closing date for comments. We may change these special conditions based on the comments we receive.

Background

On May 30, 2012, Bombardier applied for an amendment to Type Certificate No. T00003NY to include the new Model BD-700-2A12 and BD-700-2A13 series airplanes. The Bombardier Model BD-700-2A12 and BD-700-2A13 series airplanes, which are derivatives of the Model BD-700 airplane currently approved under Type Certificate No. T00003NY, are business jets with a maximum certified passenger capacity of 19. The maximum takeoff weight of the Model BD-700-2A12 airplane is 106,250 lbs. and 104,800 lbs. for the Model BD-700-2A13 airplane.

Type Certification Basis

Under the provisions of title 14, Code of Federal Regulations (14 CFR) 21.101, Bombardier must show that the Model BD-700-2A12 and BD-700-2A13 series airplanes meet the applicable provisions of the regulations listed in Type Certificate No. T00003NY, or the applicable regulations in effect on the date of application for the change except for earlier amendments as agreed upon by the FAA.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 25) do not contain adequate or appropriate safety standards for the Model BD-700-2A12 and BD-700-2A13 series airplanes because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same novel or unusual design feature, or should any other model already included on the same type certificate be modified to incorporate the same novel or unusual design feature, these special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and special conditions, the Bombardier Model BD-700-2A12 and BD-700-2A13 series airplanes must comply with the fuel-vent and exhaust-emission requirements of 14 CFR part 34, and the noise-certification requirements of 14 CFR part 36.

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type certification basis under § 21.101.

Novel or Unusual Design Features

The Model BD-700-2A12 and BD-700-2A13 series airplanes will incorporate the following novel or unusual design features:

Flight-deck design incorporating a synthetic vision system that displays video imagery on the HUD.

Discussion

When the FAA began to evaluate the display of enhanced vision-system (EVS) imagery on the HUD, significant potential to obscure the outside view became apparent, contrary to the requirements of § 25.773. This rule does not permit distortions and reflections in the pilot-compartment view that can interfere with normal duties, and the FAA did not write a rule in anticipation of such technology. The video image potentially interferes with the pilot's ability to see the natural scene in the center of the forward field of view.

The FAA issued special conditions for such HUD/EVS installations to ensure that the level of safety required by § 25.773 would be met even when the image might partially obscure the outside view. While many of the characteristics of EVS and SVS video differ, they have one thing in common: the potential for interference with the outside view through the airplane windshield. Although the pilot may be able to see around and through small, individual symbols on the HUD, the pilot may not be able to see around or through the image that fills the display without some interference of the outside view. Nevertheless, the SVS may be capable of meeting the required level of safety when considering the combined view of the image and the outside scene visible to the pilot through the image. It is essential that the pilot can use this combination of image and natural view of the outside scene as safely and effectively as is the pilot-compartment view currently available without the SVS image.

Because § 25.773, at the applicable amendment level, does not provide for any alternatives or considerations for a novel or unusual design feature, the FAA establishes safety requirements that assure an equivalent level of safety and effectiveness of the pilot-compartment view as intended by that rule. The purpose of these special conditions is to provide the unique pilot-compartment-view requirements for the SVS installation.

These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

Applicability

As discussed above, these special conditions are applicable to the Bombardier Model BD-700-2A12 and BD-700-2A13 series airplanes. Should Bombardier apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, these special conditions would apply to that model as well.

Conclusion

This action affects only certain novel or unusual design features on one model series of airplanes. It is not a rule of general applicability.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40113, 44701, 44702, 44704.

The Special Conditions

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for Bombardier Model BD-700-2A12 and BD-700-2A13 series airplanes:

1. During any phase of flight in which it is to be used, the synthetic vision system (SVS) imagery on the head-up display (HUD) must not degrade flight safety or interfere with the effective use of outside visual references for required pilot tasks.
2. To avoid unacceptable interference with the safe and effective use of the pilot-compartment view, the SVS must meet the following requirements:
 - a. The SVS design must minimize unacceptable display characteristics or artifacts (e.g., terrain shadowing against a dark background, noise, “burlap” overlay) that obscure the desired image of the scene, impair the pilot’s ability to detect and identify visual references, mask flight hazards, distract the pilot, or otherwise degrade task performance or safety.
 - b. Control of SVS image-display brightness must be sufficiently effective in dynamically changing background (ambient) lighting conditions to avoid pilot distraction, impairment of the pilot’s ability to detect and identify visual references, masking of flight hazards, or to otherwise degrade task performance or safety. If automatic control for image brightness is not provided, it must be shown that a single, manual setting is satisfactory for the range of lighting conditions encountered during a time-critical, high-workload phase of flight (e.g., low-visibility instrument approach).

- c. A readily accessible control must be provided that permits the pilot to immediately deactivate and reactivate display of the SVS image on demand, without having to remove hands from the flight controls and throttles.
- d. The SVS image on the HUD must not impair the pilot's use of guidance information, or degrade the presentation and pilot awareness of essential flight information displayed on the HUD, such as alerts, airspeed, attitude, altitude and direction, approach guidance, windshear guidance, traffic-alert and collision-avoidance system-resolution advisories, or unusual-attitude recovery cues.
- e. The SVS image and the HUD symbols, which are spatially referenced to the pitch scale, outside view, and image, must be scaled and aligned (i.e., conformal) to the external scene. In addition, the SVS image and the HUD symbols—when considered singly or in combination—must not be misleading, cause pilot confusion, or increase workload. Airplane attitudes or cross-wind conditions may cause certain symbols (e.g., the zero-pitch line or flight-path vector) to reach field-of-view limits, such that they cannot be positioned conformally with the image and external scene. In such cases, these symbols may be displayed but with an altered appearance that makes the pilot aware that they are no longer displayed conformally (for example, “ghosting”). The combined use of symbology and runway image may not be used for path monitoring when path symbology is no longer conformal.
- f. A HUD system that displays SVS images must, if previously certified, continue to meet all of the requirements of the original approval.

3. The safety and performance of the pilot tasks associated with the use of the pilot-compartment view must not be degraded by the display of the SVS image. These tasks include the following:
 - a. Detection, and accurate identification and maneuvering as necessary, to avoid traffic, terrain, obstacles, and other flight hazards.
 - b. Accurate identification and utilization of visual references required for every task relevant to the phase of flight.
4. Appropriate limitations must be stated in the Operating Limitations section of the Airplane Flight Manual to prohibit the use of the SVS for functions that have not been found to be acceptable.

Issued in Des Moines, Washington.

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